

# PATENT SPECIFICATION

DRAWINGS ATTACHED



1089,667

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## COMPLETE SPECIFICATION

### Improvements in or relating to Anti-Water Hammer Devices

We, REGIE NATIONALE DES USINES RENAULT, a French Body Corporate of 8/10, Avenue Emile Zola, Billancourt (Seine), France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an efficient anti-water-hammer device of simple and compact design, basically consisting of a rigid chamber connected through a pipe to the hydraulic circuit to be protected and the entire capacity of which is filled, when the circuit is operating normally, by a rubber cushion in which are formed cells containing air. When an overpressure tends to develop in the circuit, the rubber cushion is compressed to a greater or lesser degree, thereby deforming the rubber between the cells and compressing the air therein, whereby said overpressure is countered by a proportionate elastic reaction which effectively avoids a water-hammer effect.

A possible form of embodiment of the invention will now be more particularly described with reference to the accompanying non-limitative exemplary drawing, in which,

Figure 1 is a sectional view of the device in its normal state;

Figure 2 is a section taken through the same when an overpressure is prevailing; and

Figure 3 shows the curve obtained, for a given type of device, by plotting the pressure against the volume of liquid absorbed by the device through the crushing of its compressible cushion.

The device shown in the drawing comprises a rigid chamber formed by two shells 1 and 2 joined together by the crimping thereon of an edging 3. The liquid in the circuit to be protected can communicate with this cham-

ber through a pipe 4 welded to the top of the shell 2.

A rubber cushion 5 which, in the absence of an overpressure (see Figure 1) occupies the entire volume bounded by the chamber 1, 2, is set into the edging 3 together with the two shells 1, 2.

This cushion has formed therein cells 6 containing air, and these cells may be separated by partitions 7. In an alternate embodiment, the cells may intercommunicate, the portions 7 then taking the form of columns.

In the event of an overpressure (see Figure 2), the cushion 5 is crushed and deforms the portions 7, thereby elastically compressing the air contained in the cells 6. (The outline of the distorted portions 7 shown in Figure 2 results from the fact that, in the specific example herein described, said portions embody bulges which do not appear in the sectional plane of Figure 1). The liquid in the hydraulic circuit to be protected enters the chamber through the pipe 4, wherein the volume  $v$  it occupies as a function of the pressure  $p$  is plotted along the curve C represented by way of example in Figure 3.

It will readily be appreciated that different curves will be obtained with different cushions, according to the stiffness of the rubber or the structure of the cushion. It will, of course, be understood that the number, diameter and shape of the cells in the cushion may be varied as desired.

#### WHAT WE CLAIM IS:—

- An anti-water-hammer device comprising a rigid chamber communicating with the hydraulic circuit to be protected and containing a rubber cushion having air-filled cells therein, said cushion occupying the entire internal space of said rigid chamber when on overpressure exists in said circuit but being crushed

[Price 4s. 6d.]

- responsively to an overpressure through an elastic deformation of the rubber between said cells and through elastic compression of the air in said cells, this crushing effect causing a certain volume of liquid to be temporarily admitted into said chamber that is a function of the pressure of said liquid and that can be predetermined.
2. An anti-water-hammer device according to claim 1, wherein said rigid chamber is formed by two metal shells secured together along said perimeters by an external edging.
3. A device according to claim 2, wherein said elastic cushion is secured to said chamber by the external edging that unites said shells.
4. A device according to claim 1, wherein said cells are separated from one another.
5. A device according to claim 1, wherein said cells intercommunicate.
6. A device according to claim 1, integrated into a pump that is to be protected against overpressures.
7. An anti-water-hammer device substantially as described hereinabove with reference to the accompanying drawings.

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COMPLETE SPECIFICATION

*This drawing is a reproduction of  
the Original on a reduced scale*

Fig. 1

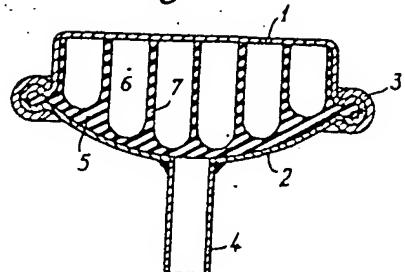


Fig. 2

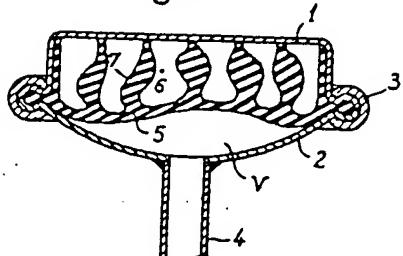


Fig. 3

